SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-42

Name: Wilmarth Lake **County**: Aurora
Legal Description: T105N-R65W-Sec 35, 36
Location from nearest town: 10 miles north, 4 miles west of Plankinton, SD

Dates of present survey: May 26, 2009 (all species electrofishing)
Dates of last survey: May 30, 2007 (all species electrofishing)

Primary Game Species	Other Species
Largemouth Bass	Black Bullhead
Bluegill	Yellow Perch
	Black Crappie
	Northern Pike
	Hybrid Sunfish

PHYSICAL DATA

Surface area: 103 acres **Watershed area**: 34,812 acres
Maximum depth: 26 feet **Mean depth**: 11 feet
Volume: 1027 acre-feet **Shoreline length**: 3.2 miles
Contour map available: Yes **Date mapped**: 1969
Lake elevation observed during the survey: Full
Beneficial use classifications: (4) warmwater permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Introduction

Wilmarth Lake was created by the construction of a dam across Firesteel Creek by the Works Progress Administration (WPA) in 1936. The lake was named for Fred Wilmarth who had lived on a farm near the lake since 1906. Wilmarth gets its water from the East and West Forks of Firesteel Creek and their associated watersheds. Outflows exit over the spillway into Firesteel Creek and continue downstream through Lake Mitchell into the James River.

Ownership of Lake and Adjacent Lakeshore Properties

Except for the extreme west and a portion of the north shore, Wilmarth Lake is owned and managed by the South Dakota Department of Game, Fish and Parks.

Fishing Access

The Wilmarth Lake Access Area on the northwest end of the lake contains a boat ramp and public toilet. Several vehicle trails provide shore-fishing access along the north side of the lake.

Field Observations of Water Quality and Aquatic Vegetation

The water in Wilmarth Lake was somewhat turbid during the survey with a Secchi depth measurement of 1.0 m (39.4 in). The lake is heavily vegetated with common cattail (*Typha spp.*), sago pondweed (*Potamageton pectinatus*), and coontail (*Ceratophyllum demersum*) around most of the shoreline.

BIOLOGICAL DATA

Methods:

Wilmarth Lake was sampled on May 26, 2009 by one hour and 40 minutes of nighttime electrofishing covering five different sites. Electrofishing sites are displayed in Figure 4.

Results and Discussion:

Electrofishing Catch

Bluegill (65.6%), black bullhead (24.7%), and largemouth bass (6.9%) were the most common species in the electrofishing sample (Table 1). Other species sampled were northern pike, black crappie, and green sunfish.

Table 1. Catch from one hour and forty minutes of electrofishing at five sites on Wilmarth Lake, Aurora County, May 26, 2009. [1] CPUE was calculated as catch/hour.

Species	Number	Percent	CPUE[1]	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Bluegill	191	65.6	114.6	±38.2	77.0	44	0	114
Black Bullhead	72	24.7	43.2	±14.4	120.7	96	6	104
Largemouth Bass	20	6.9	12.0	±4.0	46.6	84	42	116
Northern Pike	5	1.7	3.0	±1.0	3.3	--	--	--
Black Crappie	2	0.7	1.2	±0.4	29.6	--	--	--
Green Sunfish	1	0.3	0.6	±1.1	1.6	--	--	--

* 4 years (2001, 2003, 2005, 2007).

Table 2. Catch per unit effort by length category for various fish species captured by electrofishing in Wilmarth Lake May 26, 2009.

Species	Substock	Stock	S-Q	Q-P	P+	All sizes	80% C.I.
Bluegill	--	114.6	64.2	50.4	--	114.6	±38.2
Black Bullhead	--	43.2	1.8	39.0	2.4	43.2	±14.4
Largemouth Bass	0.6	11.4	1.8	4.8	4.8	12.0	±4.0
Northern Pike	--	3.0	1.2	1.2	0.6	3.0	±1.0
Black Crappie	--	1.2	0.6	0.6	--	1.2	±0.4
Green Sunfish	--	0.6	0.6	--	--	0.6	±1.1

Length categories can be found in Appendix A.

[1] See Appendix A for definitions of CPUE, PSD, and mean Wr.

Largemouth Bass

Management objective: Maintain a largemouth bass fishery with an electrofishing CPH of at least 20 for stock length (≥20 cm, 8 in) and longer fish and a RSD-P of 20-40.

Largemouth bass catch per hour (CPH) was 12.0 for all sizes of fish and 11.4 for stock length (≥20 cm, 8 in) and longer fish (Table 3), a significant decline from 2007. The bass sampled ranged in length from 19 to 47 cm (7.5 to 18.5 inches) (Figure 1) and two to seven years in age (Table 4). Forty bass over 20 cm (8 in) were pit tagged for future study.

Bass growth in Wilmarth was faster than statewide, regional, and small lakes and impoundments means (Table 4). A large year class was naturally-produced in 2006 and remains the most abundant year class sampled.

Table 3. Largemouth bass electrofishing CPUE, PSD, RSD-P, and mean Wr for Wilmarth Lake, Aurora County, 2001-2009.

	2001	2002	2003	2004	2005	2007	2009	Mean*
CPUE	3.9		45.5		28.0	52.8	12.0	40.4
PSD	100		32		98	70	84	84
RSD-P	63		18		12	60	42	36
Mean Wr	100		125		111	116	116	114

* 5 years (1999, 2001, 2003, 2005, 2007) for PSD, RSD-P and mean Wr

Table 4. Average back-calculated lengths (mm) for each age class of largemouth bass in Wilmarth Lake, Aurora County, 2009.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2007	2	3	83	206						
2006	3	5	102	224	291					
2005	4	4	108	181	265	322				
2004	5	4	103	253	323	361	386			
2003	6	1	146	296	348	369	383	395		
2002	7	3	120	227	317	365	405	423	437	
All Classes		**20**	**110**	**231**	**309**	**354**	**391**	**409**	**437**	
Statewide Mean			96	182	250	305	342			
Region III Mean			111	212	287	347	383			
SLI* Mean			99	183	246	299	332			

*Small Lakes and Impoundments (<150 acres)

Bluegill

Management objective: Maintain a bluegill population with an electrofishing CPH of at least 50 and a RSD-18 of at least 20.

Bluegill electrofishing CPH was similar to 2007 (Table 5). Age-2 fish dominated the sample explaining the decrease in PSD and RSD-18 when compared to 2005 (Figure 2). No bluegills over age-5 were sampled.

Bluegill growth was similar to statewide, regional and small lakes and impoundments means (Table 6) and has improved substantially from previous surveys. Growth may have improved in response to decreased black crappie abundance (Table 7). Bluegill condition (Wr) has remained high.

Table 5. Bluegill CPUE, PSD, RSD-18, and mean Wr for Wilmarth Lake, Aurora County, 2001-2009.

	2001	2002	2003	2004	2005	2007	2008	2009
CPUE	427.5		109.8		19.0	109.8		114.6
PSD	70		32		28	31		44
RSD-18	0		21		6	4		0
Mean Wr	108		125		123	139		114

Table 6. Average back-calculated lengths (mm) for each age class of bluegill in Wilmarth Lake, Aurora County, 2009.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2007	2	102	53	113						
2006	3	71	41	104	153					
2005	4	16	39	103	145	159				
2004	5	2	87	128	157	172	184			
All Classes		**191**	**55**	**112**	**151**	**166**	**184**			
Statewide Mean			55	103	141	166	180			
Region III Mean			60	116	157	180	190			
SLI* Mean			53	101	138	163	180			

*Small Lakes and Impoundments (<150 acres)

Black Crappie

The black crappie population in Wilmarth Lake is very cyclic (Table 7) and in 2009, only two fish were sampled. Strong year classes have been produced but natural mortality is high and recruitment is sporadic.

Table 7. Black crappie CPUE, PSD, RSD-P, and mean Wr for Wilmarth Lake, Aurora County, 2001-2009.

	2001	2002	2003	2004	2005	2007	2008	2009
CPUE	4.5		300.0		0.3	44.4		1.2
PSD	0		0		--	38		--
RSD-P	--		0		--	0		--
Mean Wr	94		115		--	109		--

Black Bullhead

Management objective: Maintain a black bullhead fishery with an electrofishing CPH of no more than 50.

The 2009 black bullhead electrofishing CPUE was similar to 2005 and 2007; however, PSD was much higher (Table 8) indicating a shift in the population size structure toward larger fish. Sampled fish ranged in length from 200 to 320 mm (7.9-12.6 in) with a mean of 255 mm (10.0 in) (Figure 3).

Table 8. Black bullhead CPUE, PSD, RSD-P, and mean Wr for Wilmarth Lake, Aurora County, 2001-2009.

	2001	2002	2003	2004	2005	2007	2008	2009
CPUE	803.7		312.3		55.0	55.8		43.2
PSD	7		70		57	52		96
RSD-P	0		0		0	43		6
Mean Wr	--		94		101	106		104

Table 9. Electrofishing CPH for all fish species sampled in Wilmarth Lake, Aurora County, 2001-2009.

Species	2001	2002	2003	2004	2005	2006	2007	2008	2009
BLB	267.9		104.1		54.9		55.8		43.2
NOP	1.5		2.1		0.6		9.0		3.0
GSF	0.6		--		4.5		1.2		0.6
OSF	0.6		--		--		--		--
HYB	2.4		2.1		--		2.4		--
BLG	142.5		36.6		18.9		109.8		114.6
LMB	3.9		45.6		84.0		52.8		12.0
BLC	1.5		100.0		0.6		16.1		1.2
YEP	3.5		84.6		9.9		1.2		--
WAE	--		0.6		--		--		--

BLB (Black Bullhead), NOP (Northern Pike), GSF (Green Sunfish), HYB (Hybrid Sunfish), BLG (Bluegill), LMB (Largemouth Bass), BLC (Black Crappie), YEP (Yellow Perch), WAE (Walleye)

MANAGEMENT RECOMMENDATIONS

1. Continue to monitor Wilmarth with an electrofishing survey every other year.

2. Continue the aquatic vegetation control program to maintain open areas for shore fishing.

3. If natural reproduction does not continue to maintain the population, stock 15-30 cm (6-12 inch) largemouth bass to control bullheads, increase panfish quality and provide a desirable bass fishery.

Table 10. Stocking record for Wilmarth Lake, Aurora County, 1991-2009.

Year	Number	Species	Size
1991	15,584	Largemouth Bass	Fingerling
	20,000	Largemouth Bass	Med. Fingerling
1992	10,000	Channel Catfish	Fingerling
	2,530	Walleye	Lrg. Fingerling
1994	3,000	Walleye	Lrg. Fingerling
	1,144	Yellow Perch	Adult
1995	5,000	Walleye	Sml. Fingerling
	1,000	Yellow Perch	Adult
1996	10,400	Largemouth Bass	Fingerling
1997	175	Largemouth Bass	Fingerling
1998	10,000	Largemouth Bass	Fingerling
1999	9,500	Largemouth Bass	Fingerling
2002	136	Largemouth Bass	Adult

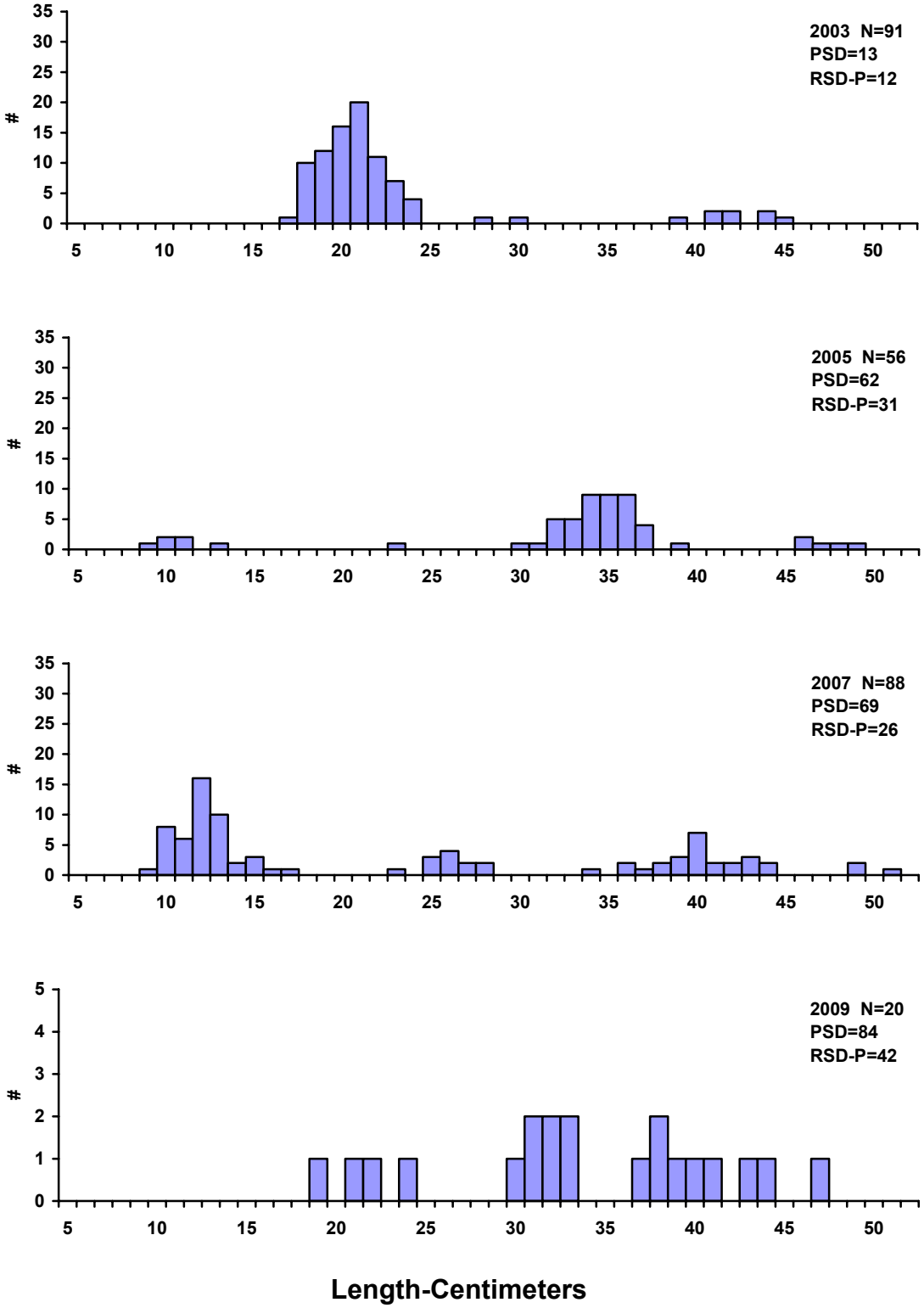


Figure 1. Length frequency histograms for largemouth bass sampled by electrofishing in Wilmarth Lake, Aurora County, 2003, 2005, 2007, and 2009.

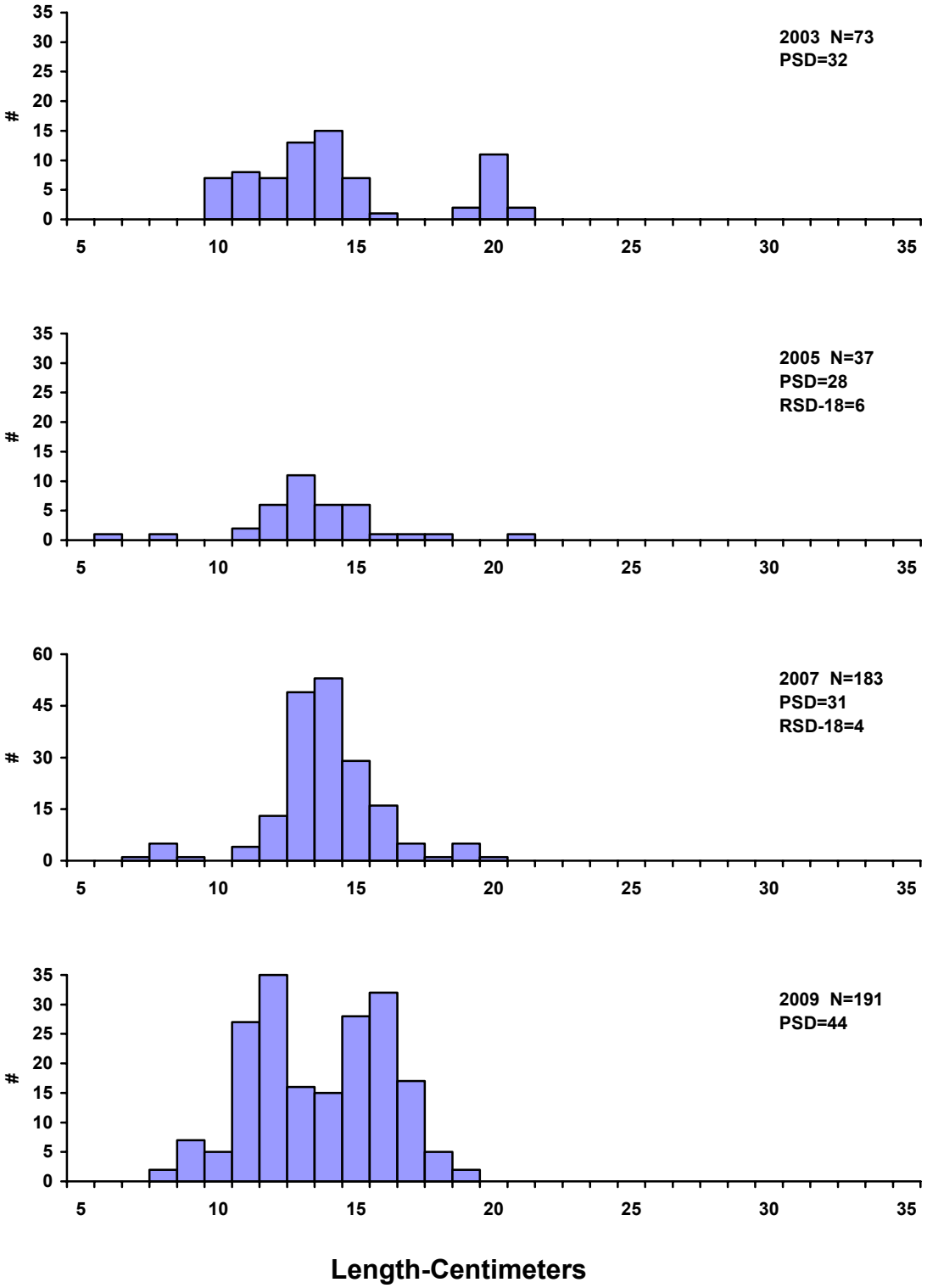


Figure 2. Length frequency histograms for bluegill sampled by electrofishing in Wilmarth Lake, Aurora County, 2003, 2005, 2007 and 2009.

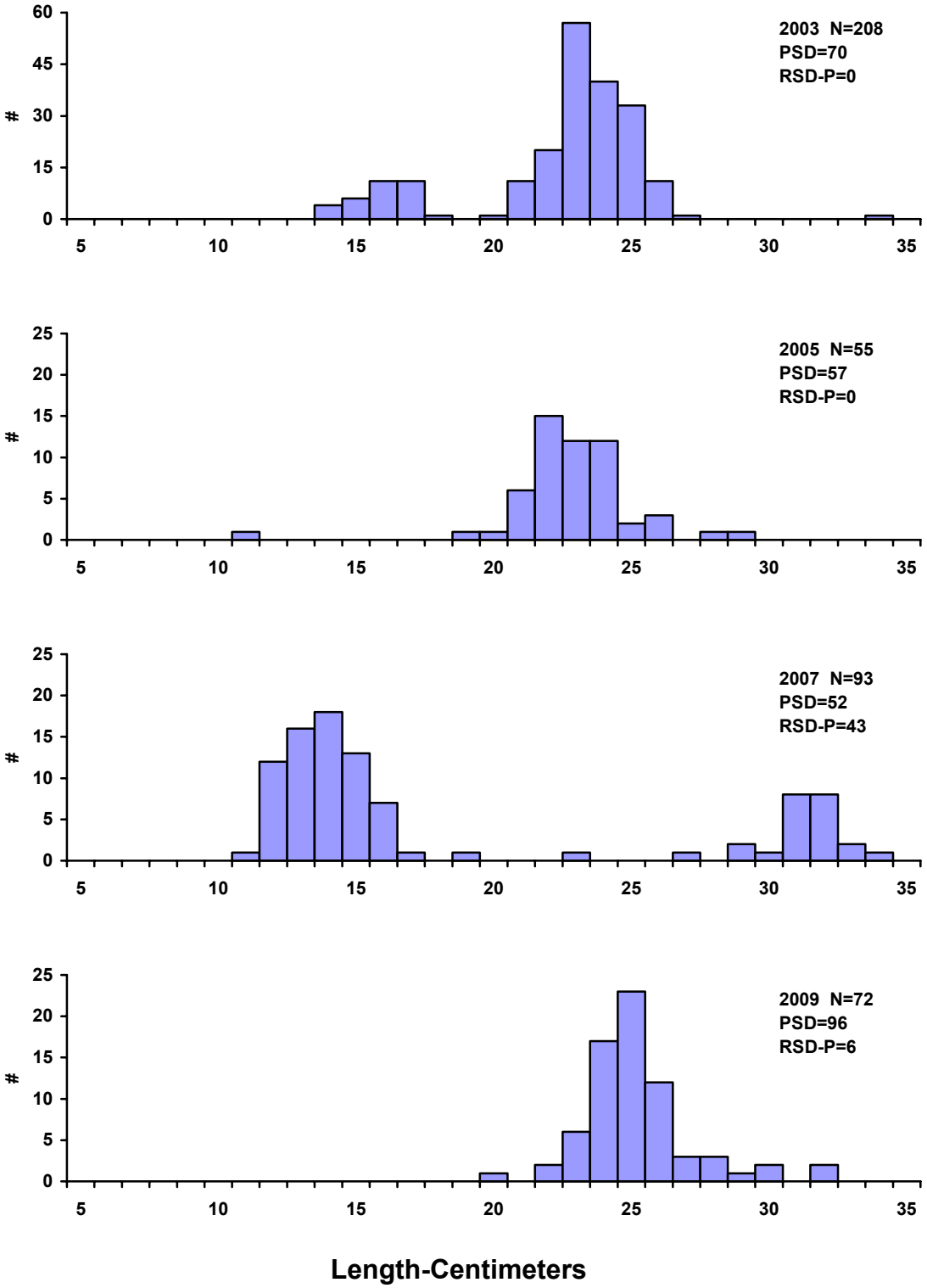
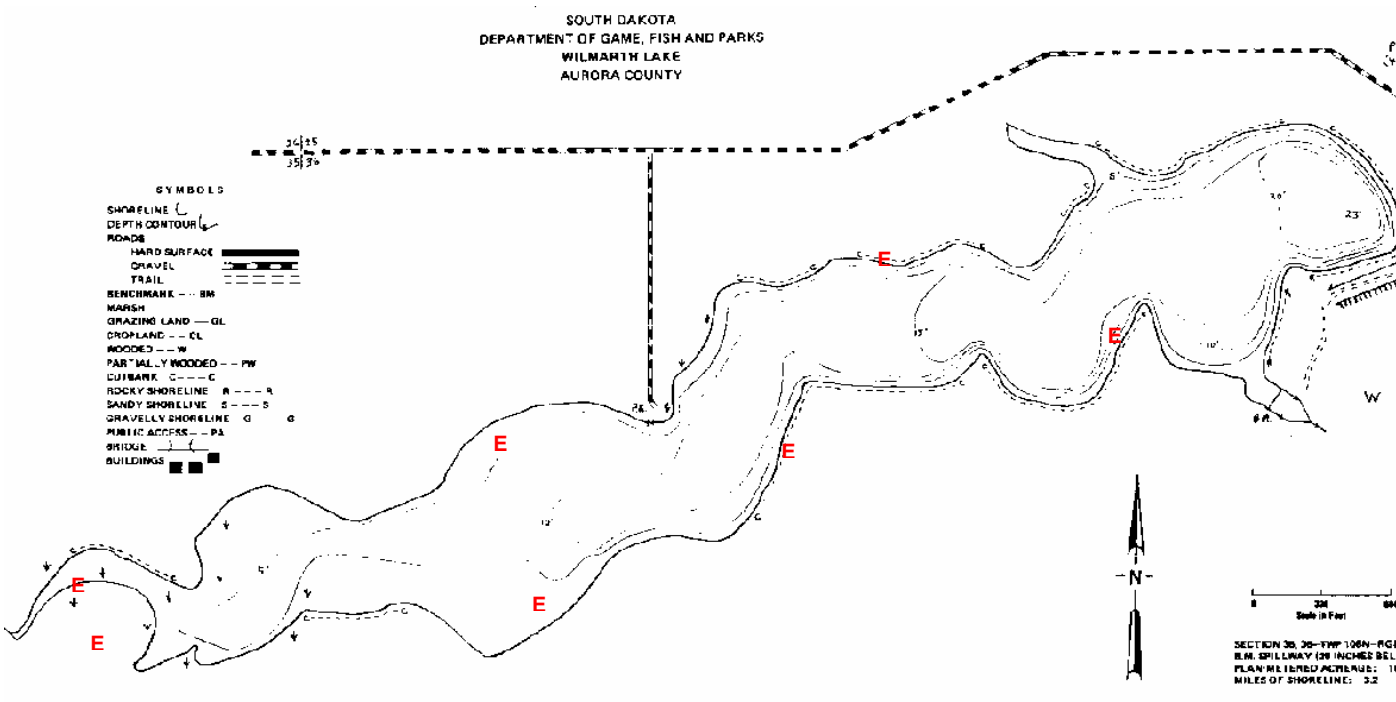


Figure 3. Length frequency histograms for black bullheads sampled by electrofishing in Wilmarth Lake, Aurora County, 2003, 2005, 2007, and 2009.



Legend
Electrofishing Sites: E

Figure 4. Sampling locations on Wilmarth Lake, Aurora County, 2009.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$PSD = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$RSD\text{-}P = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

$$RSD\text{-}18 = \frac{\text{Number of fish} > 18\text{ cm}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.